Exploration Capabilities

Autonomous Mission Operations (AMO)

Completed Technology Project (2011 - 2014)

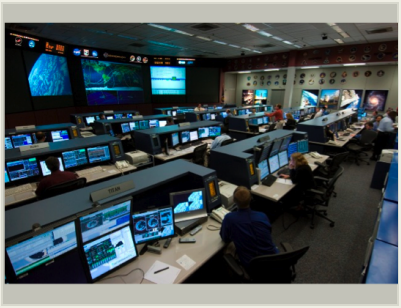
Project Introduction

The AES Autonomous Mission Operations project will develop understanding of the impacts of increasing communication time delays on mission operations and develop automation technologies to mitigate the impacts. The technologies are expected to reduce operations costs as well. This will be tested on ISS in FY14. The results of this project are being incorporated and built upon in the Autonomous Systems and Operations project.

Future human spaceflight missions will occur with crews and spacecraft at large distances, with long communication delays to the Earth. The one-way light-time delay to the Moon is 1.3 seconds, which is sufficient to make some scenarios (e.g. landing) difficult or impossible to conduct from Earth. One-way communication delays to human exploration destinations such as Near Earth Asteroids (NEA) at close approach range from seconds to minutes. The one-way light-time delay to Mars ranges from 3 minutes (at conjunction) to 22 minutes (at opposition). As the communication delays increase, the crews in the spacecraft must execute, and manage, much of the mission themselves. Throughout the course of a mission, as distances increase, NASA must continue to migrate operations functionality from the Mission Control Center flight control room to the vehicle for use by the crew. The role of the ground control teams and systems will evolve away from real-time support to more long-range planning, diagnosis, analysis and prognostics support role. While the vehicle systems and crew must take on the role of onboard daily schedule execution, planning, and systems management. Both ground and vehicle systems will require automation to maximize crew functionality, minimize unnecessary overhead, and reduce operating costs. This project is to understand the impacts of increasing communications time delays on operations and to develop technologies to mitigate the impacts.

Anticipated Benefits

This technology should increase mission success while decreasing probability of loss of life. It will also reduce cost of operations.



Project Image Autonomous Mission Operations

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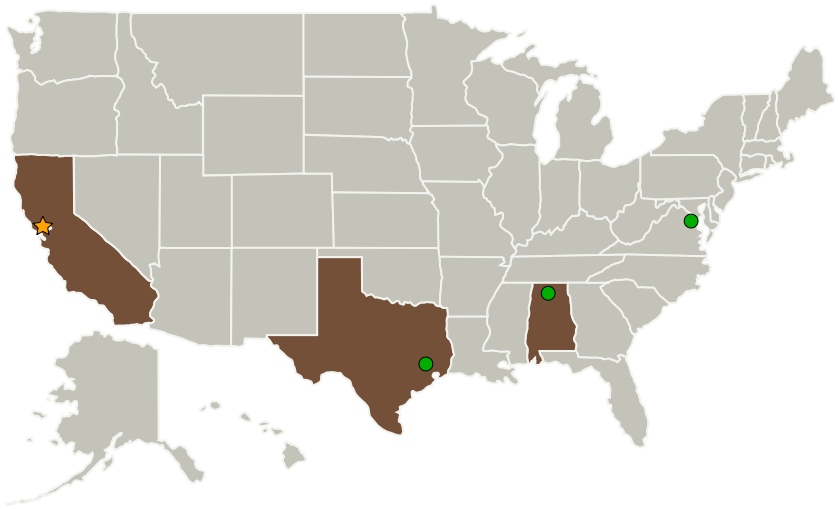
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California
●Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas
●Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama
●NASA Headquarters(HQ)	Supporting Organization	NASA Center	Washington, District of Columbia

Primary U.S. Work Locations	
Alabama	California
District of Columbia	Texas

Organizational Responsibility

Responsible Mission Directorate:

Exploration Systems Development Mission Directorate (ESDMD)

Lead Center / Facility:

Ames Research Center (ARC)

Responsible Program:

Exploration Capabilities

Project Management

Program Director:

Christopher L Moore

Project Manager:

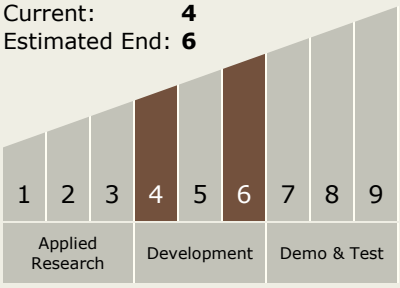
Jeremy D Frank

Principal Investigator:

Jeremy D Frank

Technology Maturity (TRL)

Start: **4**
Current: **4**
Estimated End: **6**



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Project Transitions

October 2011: Project Start

September 2014: Closed out

Closeout Summary: To request closeout information for this project, please send an email with the Subject "TechPort Closeout Report Request" to hq-aes@mail.nasa.gov and specify which project closeout report you are requesting.

Images

39.png
Project Image Autonomous Mission Operations
(https://techport.nasa.gov/image/1262)

Links

Autonomous Mission Operations EXPRESS Autonomous Operations Project (AMO-EXPRESS)
(http://www.nasa.gov/mission_pages/station/research/experiments/1335.html)

Autonomous Mission Operations TOCA Autonomous Operations Project (AMO-TOCA) Experiment
(http://www.nasa.gov/mission_pages/station/research/experiments/1248.html)

Technology Areas

Primary:

- TX07 Exploration Destination Systems
  - TX07.3 Mission Operations and Safety
    - TX07.3.2 Integrated Flight Operations Systems